NASA Innovative Advanced Concepts

Optically Controlled and Corrected Active Meta-material Space Structures (OCCAMS)

Completed Technology Project (2012 - 2014)

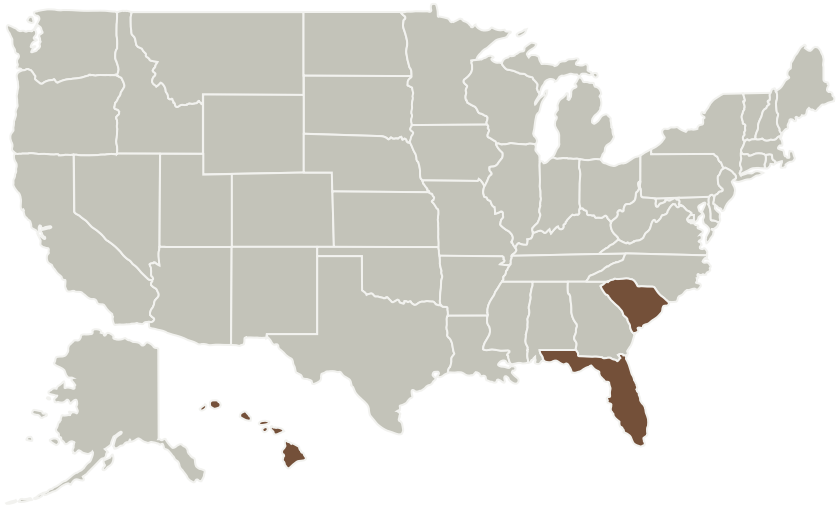
Project Introduction

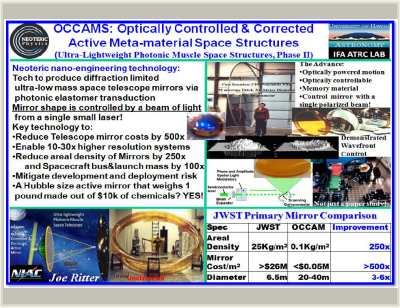
Photons weigh nothing. Why must even small space telescopes have high mass? Our team has demonstrated this is not the case using a completely novel approach to producing and correcting active optical primary mirrors to be used specifically for NASA's future large space telescope missions. Unprecedented advances in nano-engineered meta-materials have produced a laser actuated liquid crystal elastomer (LCE) polymer substrate with controllable reversible bi-directional bending. Using our novel optically controlled molecular actuators allows substitution of optically induced control for rigidity and mass.

Anticipated Benefits

Benefits of this project include a more exciting science and exploration future and a more robust national capability for aerospace activities enabling new industries and contributing to economic growth.

Primary U.S. Work Locations and Key Partners





Project Image OCCAMS: Optically Controlled and Corrected Active Meta-material Space Structures (Ultra-Lightweight Photonic Muscle Space Structures Phase II)

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Organizations Performing Work	Role	Type	Location
Neoteric Physics, Inc.	Lead Organization	Industry	
BeamCo	Supporting Organization	Industry Women-Owned Small Business (WOSB)	
Lander University	Supporting Organization	Academia	Greenwood, South Carolina
University of Hawaii Maui College	Supporting Organization	Academia	Kahului, Hawaii

Primary U.S. Work Locations	
Florida	Hawaii
South Carolina	

Project Transitions

September 2012: Project Start

August 2014: Closed out

Closeout Summary: Operational parameters and schemes for array readout, failure handling, ground ops and organizations, observatory maintenance and visits, fine guiding scenarios, full instrument designs etc. are well beyond the NIAC request for a baseline mission plan and are not evaluated here. A true mission architecture would require a 1000 pages. The ExoSat-A mission has been presented here as a merger of near term possibilities that are cost effective and feasible. The existence of OCCAM ExOSAT-A and any other OCCAM based technologies ultimately depends on future NASA funding to complete the OCCAM telescope and test the concept then to scale it. The goal of the NIAC study was to show that items like a 1 pound Hubble size mirror are possible and in fact within our reach. The notional mission above is but one example of many possible missions using OCCAM technology.

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Neoteric Physics, Inc.

Responsible Program:

NASA Innovative Advanced Concepts

Project Management

Program Director:

Jason E Derleth

Program Manager:

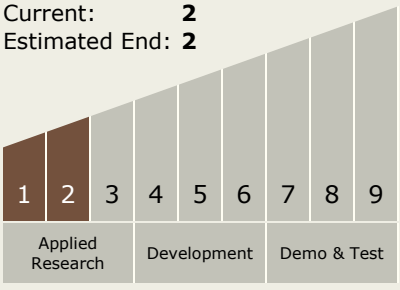
Eric A Eberly

Principal Investigator:

Joe Ritter

Technology Maturity (TRL)

Start: **1**
Current: **2**
Estimated End: **2**



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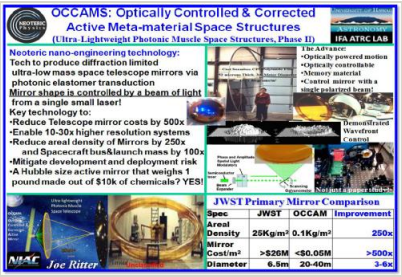
Images



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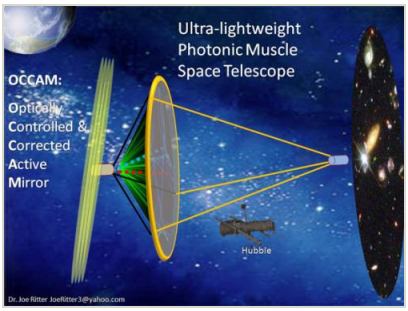
Project Image OCCAMS: Optically Controlled and Corrected Active Meta-material Space Structures (Ultra-Lightweight Photonic Muscle Space Structures Phase II) *(https://techport.nasa.gov/image/102266)*



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Project Image OCCAMS: Optically Controlled and Corrected Active Meta-material Space Structures (Ultra-Lightweight Photonic Muscle Space Structures Phase II) *(https://techport.nasa.gov/image/102168)*

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.2 Observatories
    - TX08.2.1 Mirror Systems

Target Destinations

Foundational Knowledge, Others Inside the Solar System